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A NEW SPECIES OF *HESIOCAECA* (POLYCHAETA: HESIONIDAE) FROM HYDROTHERMAL VENTS AT THE MARIANA BACK-ARC BASIN WITH NOTES ON OTHER POLYCHAETES

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Abstract.—*Hesiocaeca hessleri* (family Hesionidae) is newly described from hydrothermal vents at the Mariana back-arc basin and is only the second species to be described in this deep-sea genus. The new species is most closely related to North Atlantic congeners rather than species from the eastern Pacific. Descriptive comments are provided on two additional polychaetes, *Nicomache arwidssoni* (family Maldanidae) and *Amphisamytha galapagensis* (family Ampharetidae), that have also been found at this site.

As part of continuing exploration of active hydrothermal vents, an expedition to the Mariana back-arc basin in the central Pacific was conducted in April and May 1987. Back-arc basins develop behind volcanic arcs bordering the deep trenches that occur where one plate dips beneath another. The Mariana back-arc basin is one such site that has developed in proximity to the Marianas Trench and the volcanic archipelago that composes the Marianas Islands. Back-arc spreading centers are isolated from mid-oceanic ridges and provide an opportunity to study faunas that are isolated from other hydrothermal vent ecosystems.

Polychaetes from the Mariana back-arc basin have been reported by Pettibone (1989) and Desbruyères & Laubier (1989). Pettibone (1989) described four new species of Polynoidae that belonged to four genera and three subfamilies that had been previously described by her from hydrothermal vents in the eastern Pacific. Likewise, Desbruyères & Laubier (1989) described a new species of *Paralvinella,* a genus known from all of the previously studied vent areas in the eastern Pacific. These results indicate that the isolation of the Mariana back-arc basin has been sufficient for polychaetes to evolve at the species level, but not at the generic level. Additional polychaetes collected by Dr. Robert Hessler were given to me for examination. These included representatives of the families Hesionidae, Ampharetidae, and Maldanidae. The material included a new species of the genus *Hesiocaeca,* previously known from the western North Atlantic, the ampharetid *Amphisamytha galapagensis,* known from all previously studied vent ecosystems, and the maldanid *Nicomache arwidssoni,* previously known from the Galapagos Rift hydrothermal vent area. Records and descriptive data are presented for each of these species along with remarks on their occurrence and systematic relationships.

The collections are deposited in the National Museum of Natural History, Smithsonian Institution (USNM), Washington, D.C. 20560.

Family Hesionidae
Hesiocaeca hessleri, new species
Fig. 1

Material examined.—Western central Pacific in Mariana back-arc basin, *Alvin* Dive 1843, Alice Springs, 4 May 1987, 18°12.6′N, 144°42.4′E, 3640 m, holotype and 6 paratypes (USNM 132660-1).

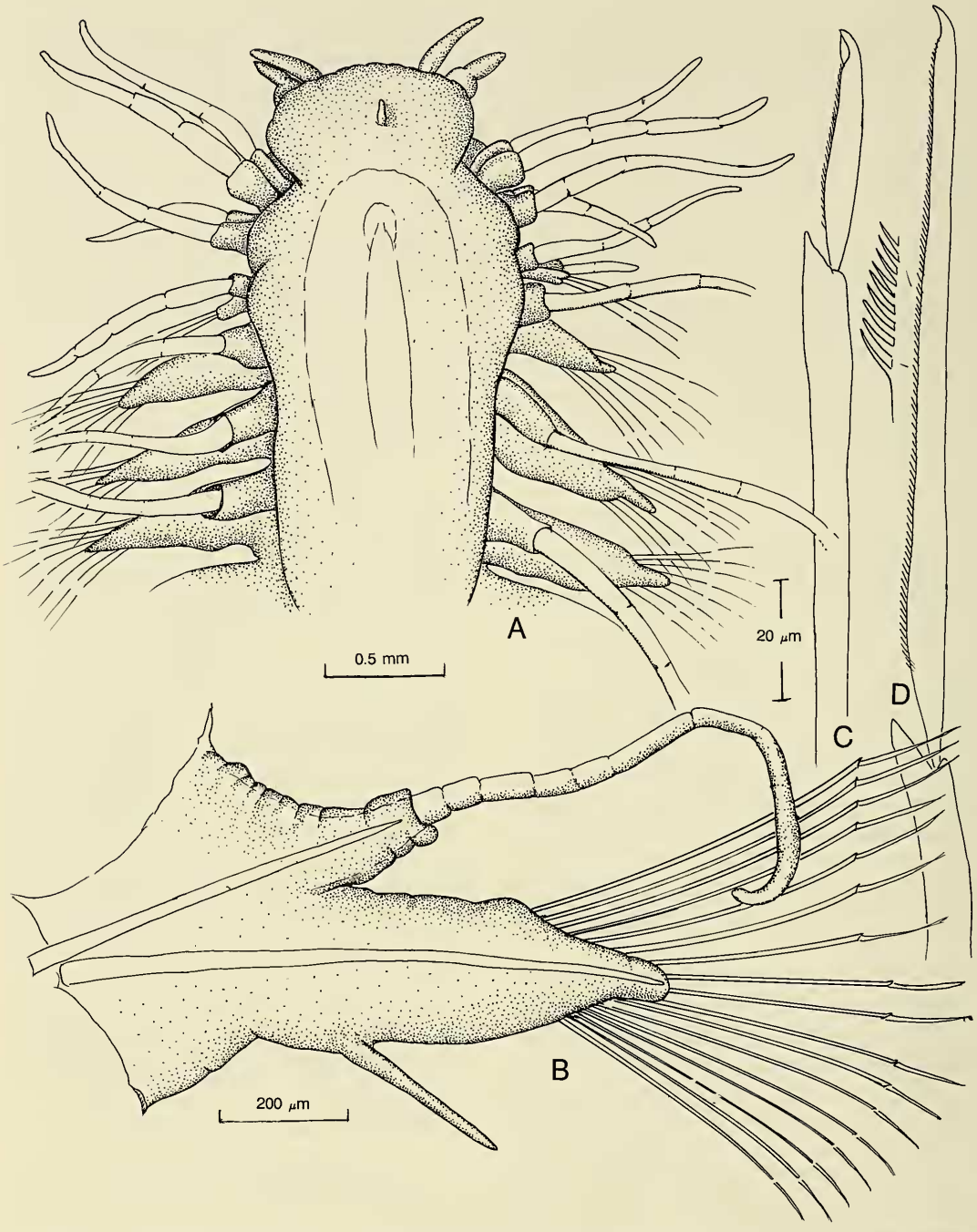

Fig. 1. *Hesiocaeca hessleri* (USNM 132601). A, Anterior end and 4 setigers in dorsal view. B, Middle parapodium, posterior view. C, Compound falciger with short blade. D, Compound falciger with long blade (inset not to scale).

Description.—Small species, widest anteriorly, tapering posteriorly; holotype measuring 5.0 mm long and 1.2 mm wide including parapodia for 27 setigers; largest paratype measuring 4.8 mm long and 1.0 mm wide for 28 setigers. Color in alcohol: flesh.

Prostomium wider than long, broad anteriorly, slightly tapering posteriorly before merging with body; 2 smooth, tapering, frontal antennae on anterior margin; with short medial antenna in middle of prostomium; palps biarticulated with enlarged bases and tapering tips; eyes absent (Fig. 1A). Proboscis not observed. Tentacular cirri numbering four pairs, inserted on 2 achaetous segments (Fig. 1A); tentacular cirri and dorsal cirri with weak, indistinct articulations.

Parapodia subbiramous with reduced notopodia bearing long, weakly articulated dorsal cirri and internal aciculum (Fig. 1B). Neuropodium well developed, with elongate presetal lobe with rounded apex, with imbedded aciculum and spreading fascicle of compound falcigers; each falciger with shaft bearing prominent tooth; blades short to long, each with fine denticles on one edge and unidentate tip bearing thin hoodlike membrane (Fig. 1C, D); falcigers with longest blades in dorsal and middle part of fascicle, setae with shortest blades ventralmost; ventral cirrus thin, fingerlike, nonarticulated. Pygidium simple, lacking cirri.

Remarks.—*Hesiocaeca hessleri* is only the second species of this deep-sea genus to be discovered and is most closely related to *H. bermudensis* Hartman, the type species, originally described from the Gay Head–Bermuda Transect off Bermuda in 1000–2500 m (Hartman 1965, Hartman & Fauchald 1971). *Hesiocaeca hessleri* differs from *H. bermudensis* in having a short medial antenna in the middle of the prostomium, instead of a long one at the posterior margin, and in having a prostomium that is twice as wide as long, instead of one that is nearly as wide as long.

Family Maldanidae

Nicomache arwidssoni Blake, 1985

Nicomache arwidssoni Blake, 1985:97–100, fig. 20.

Material examined.—Western central Pacific in Mariana back-arc basin, *Alvin* Dive 1843, Alice Springs, 4 May 1987, 18°12.6′N, 144°42.4′E, 3640 m, 4 specimens (USNM 132662).

Remarks.—The specimens are all small. The largest and only complete specimen is 7 mm long and 0.5 mm wide for 21 setigerous segments. The specimens are clearly juveniles and are referred to *Nicomache arwidssoni* on the basis of the number of setigers and the presence of 4 apical teeth on the rostrate hooks. This species was originally described from hydrothermal vent areas on the Galapagos Rift and the East Pacific Rise at 21°N (Blake 1985). A closely related species, *N. venticola,* has been discovered at hydrothermal vent sites on the Explorer and Juan de Fuca Ridge (Blake and Hilbig 1990). This latter species differs from *A. arwidssoni* in having 27–32 setigerous segments, instead of 21–22, and by having 2–3 apical teeth on the rostrate hooks, instead of 4. The present specimens are referred to *A. arwidssoni,* despite the separation in the geographic range.

Family Ampharetidae

Amphisamytha Hessle, 1917

Amphisamytha galapagensis Zottoli, 1983

Amphisamytha galpagensis Zottoli, 1983: 379–391, figs. 1–3.—Desbruyères et al., 1985:103–116.—Grassle, 1985:714; 1986:327.—Grassle et al., 1985:443–452.—Tunnicliffe et al., 1986:407.—Tunnicliffe, 1988:352.—Blake & Hilbig, 1990:244–246.

Material examined.—Western central Pacific in Mariana back-arc basin, *Alvin* Dive 1830, 15 April 1987, Burke Field, Anemone Heaven, Snow Pit, 18°10.9′N,

144°43.2′E, 3660 m, 6 specimens (USNM 132663); *Alvin* Dive 1836, 27 April 1987, Burke Field, Snail Pit, 3660 m, 18°10.9′N, 144°43.2′E, 1 adult and 9 juveniles (USNM 132664); *Alvin* Dive 1843, Alice Springs, 4 May 1987, 3640 m, 18°12.6′N, 144°42.4′E, 6 specimens (USNM 132665).

Description.—Body widest anteriorly, tapering posteriorly to narrow pygidium lacking appendages. Prostomium broad, smooth, lacking glandular ridges, forming dorsal lip of mouth; eyes lacking. Segments 1–3 fused, achaetous, located immediately posterior to prostomium; in juveniles, capillary notosetae transitional on segment 3. Numerous smooth oral tentacles emerging from mouth opening. Four pairs of smooth branchiae arising from achaetous segments on either side of dorsal mid-line of body. Segment 4 equals first setiger of adult; 17 thoracic setigers, uncini beginning on setiger 4; abdominal uncinigerous segments numbering 15–18. Notopodia reduced to simple lobes bearing fascicle of 6–7 limbate capillary notosetae; neuropodia including prominent pinnules bearing 15–20 uncini in single row; each uncinus with rounded basal prow surmounted by 4 teeth; small fine denticles observed on third, or largest, tooth.

Remarks.—I have compared these specimens carefully with the original account presented by Zottoli (1983) from the Galapagos Rift vents, as well as specimens from the Juan de Fuca Ridge and Gorda Ridge and can find no significant morphological differences. The species has now been reported from the seep site on the Florida Escarpment, the eastern Pacific vent sites at 13°N, Galapagos Rift, 21°N, Guaymas Basin, Gorda Ridge, and Juan de Fuca Ridge (Grassle 1986; Blake & Hilbig 1990; Blake, unpublished data), and now the Mariana back-arc basin in the central Pacific. The only apparent differences between the Mariana specimens and the original description from the Galapagos Rift were the number of abdominal uncinigerous segments (15–18, instead of 12–15) and the presence of fine denticles on some of the larger apical teeth of the uncini. These differences appear to merely represent small scale genetic variation in widespread populations and are insufficient to warrant a separate species designation. Specimens examined from the Gorda Ridge and Juan de Fuca Ridge have 12–14 abdominal uncinigerous segments. It is likely that the small denticles are actually present in the other populations and have simply been overlooked. The fact that *A. galapagensis* maintains its morphological constancy over such wide geographic distances is remarkable and suggests that evolutionary change is slow in this well adapted species. The high densities recorded for this species in the Guaymas Basin (2267 individuals per m^2) in soft sediments by Petrecca & Grassle (1989) strongly support the concept that *A. galapagensis* is an opportunistic species in hydrothermal vent ecosystems.

Discussion

The total number of polychaete species now recorded from the Mariana back-arc basin is 8: Polynoidae (4), Hesionidae (1), Maldanidae (1), Ampharetidae (1), and Alvinellidae (1). Six of these species are only known from the site, while two are also known from the eastern Pacific vent locations. All belong to genera that were previously known from deep-sea habitats or other vent localities.

The two known species of *Hesiocaeca, H. hessleri* and *H. bermudensis,* are known from the central Pacific and western North Atlantic, respectively. The first is associated with hydrothermal vents, while the second is a component of ambient infaunal communities in soft sediments. A closely related undescribed species, lacking a medial antenna, has been discovered at the cold-seep site on the Florida Escarpment. Thus, a group of closely related deep-sea hesionid

polychaetes having four pairs of tentacular cirri occurs in the Atlantic and central Pacific, but not in the eastern Pacific. This relationship is similar to the discovery of taxonomic similarity between shrimps of the genus *Rimicaris* on the mid-Atlantic Ridge and the Mariana back-arc basin (Hessler et al. 1988) and suggests a possible pattern of dispersal and adaptive radiation between Atlantic and Pacific faunas via Indian Ocean pathways. At present, however, no samples have been taken from Indian Ocean hydrothermal vents to prove or disprove this hypothesis.

The community composition of the Mariana back-arc basin differs structurally from communities at vent locations in the eastern Pacific and includes faunal elements having relationships to both the Atlantic and eastern Pacific. Polychaetes, however, have evolved only new taxa at the species level.

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